

The opinion in support of the decision being entered today was not written for publication and is not binding precedent of the Board.

Paper No. 37

UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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***Ex parte*** TAKASHI INUSHIMA, VAITKUS RIMANTAS, MASAAKI HIROKI,  
EIJI SATO and SATOSHI TERAMOTO

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Appeal No. 1996-3262  
Application No. 08/141,632

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HEARD: JULY 12, 2001

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Before JERRY SMITH, FLEMING, and GROSS, ***Administrative Patent Judges.***

FLEMING, ***Administrative Patent Judge.***

***DECISION ON APPEAL***

This is a decision on appeal from the final rejection of claims 1-3, 5, 6 and 8-17. Claim 4 has been allowed<sup>1</sup>, and claims 7 and 18-21 have been canceled.

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<sup>1</sup> Examiner's Answer (Paper No. 19)

The invention relates generally to a diamond film (figure 1, numeral 13) with a heating element (figure 1, numeral 11) and a thermistor (figure 1, numeral 12) thereon for measuring fluid properties (specification, page 12, lines 17-32 through page 13, lines 1-8). The diamond thin film acts as a base of the instrument and is in contact with the fluid (figure 1, numeral 16). Heat is carried away by the fluid through the bottom surface of the diamond, which is opposite to the surface of the diamond film on which the thermistor layer and the heating element are formed (specification, page 12, lines 30-32 through page 13, lines 1-3).

In an embodiment of the invention the thermistor and heating element are mainly thermally coupled by the diamond film (specification, page 19, lines 28-32).

In a further embodiment a heat generator produces pulses of heat and a thermistor measures the temperature variation of the diamond film (specification, page 74, lines 10-18).

Independent claims 1 and 16 are reproduced as follows:

1. An electric device for monitoring a fluid comprising:
  - a diamond film having a first surface and a second surface on an opposite side of said first surface; and
  - a resistor provided on said first surface of said diamond film and measuring a temperature of said diamond film;

Appeal No. 1996-3262  
Application No. 08/141,632

wherein at least said second surface is in contact with the fluid in response to a temperature change of said diamond film resulting from heat transfer to sense a parameter of the fluid.

16. An electric device comprising:

a film;

means for supplying a heat pulse to said film;

means for measuring a temperature variation of said film caused by said heat pulse; and

means for obtaining an output in response to said heat pulse from said temperature variation.

The Examiner relies on the following references:

Olmstead	3,942,378	Mar. 9, 1976
Bohrer et al. (Bohrer)	4,478,077	Oct. 23, 1984
Miura et al. (Miura)	4,682,496	Jul. 28, 1987
Ohta et al. (Ohta)	4,761,995	Aug. 9, 1988
Cole	4,781,065	Nov. 1, 1988
Inada et al. (Inada)	5,024,083	Jun. 18, 1991
Nakahata et al. (Nakahata)	5,081,434	Jan. 14, 1992
Kimoto et al. (Kimoto)	5,144,380	Sep. 1, 1992

Claims 1-3 are rejected under 35 U.S.C. § 102(b) as anticipated by Kimoto et al.

Claims 1-3 and 8 are rejected under 35 U.S.C. § 102(b) as anticipated by Nakahata et al.

Claims 16 and 17 are rejected under 35 U.S.C. § 102(b) as anticipated by Bohrer et al.

Claims 5, 6 and 9-15 stand rejected under 35 U.S.C. § 103 as being unpatentable over Ohta et al when taken with Nakahata et al and Inada et al.

Appeal No. 1996-3262  
Application No. 08/141,632

Claims 1-3<sup>2</sup> stand rejected under 35 U.S.C. § 103 as being unpatentable over Kimoto et al or Nakahata et al when taken with Cole or Olmstead, or Miura et al.<sup>3</sup>

Rather than reiterate the arguments of Appellants and the Examiner, reference is made to the Brief<sup>4</sup>, Reply Brief<sup>5</sup>, Supplemental Reply Briefs<sup>6</sup>, Response to Supplemental Examiner's Answer<sup>7</sup>, Examiner's Answers<sup>8</sup>, and Supplemental Examiner's Answers<sup>9</sup>

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<sup>2</sup> This rejection was first made in the Supplemental Examiner's Answer mailed August 20, 1996.

<sup>3</sup> In the advisory action mailed August 23, 1995, the Examiner withdrew the prior allowance of claim 4. Following the Appeal Brief received October 27, 1995, the Examiner in his answer mailed January 11, 1996, again allowed claim 4. The rejection of this claim is therefore not before us.

In the final rejection mailed February 24, 1995, the Examiner rejected claims 11-17 under 35 U.S.C. § 112, second paragraph, for the reasons set forth in the rejection. As the Examiner withdrew this rejection in the advisory action mailed August 23, 1995, this matter is no longer at issue.

<sup>4</sup> The Brief was received October 27, 1995.

<sup>5</sup> The Reply Brief was received March 12, 1996.

<sup>6</sup> Two Supplemental Reply Briefs were received, one on June 19, 1996, and one on October 25, 1996.

<sup>7</sup> This Response To Supplemental Examiner's Answer was received February 28, 1997.

<sup>8</sup> Two Examiner's Answers were mailed, one on January 11, 1996, and one on April 17, 1996.

<sup>9</sup> Two Supplemental Examiner's Answers were mailed, one on August 20, 1996, and one on December 26, 1996.

Appeal No. 1996-3262  
Application No. 08/141,632

for the respective details thereof<sup>10</sup>.

**OPINION**

After careful review of the evidence before us, we will sustain the rejection of claims 16 and 17 under 35 U.S.C. § 102(b) as anticipated by Bohrer et al, and the rejection of claim 1 under 35 U.S.C. § 103 as being unpatentable over Nakahata et al when taken with Cole, Olmstead or Miura et al.

We do not sustain the following rejections:

1) The rejection of claims 1-3 under 35 U.S.C. § 102(b) as anticipated by Kimoto et al; and

2) The rejection of claims 1-3 and 8 under 35 U.S.C. § 102(b) as anticipated by Nakahata et al; and

3) The rejection of claims 5, 6 and 9-15 under 35 U.S.C. § 103 over Ohta et al when taken with Nakahata et al and Inada et al; and

4) The rejection of claims 2-3 under 35 U.S.C. § 103 as

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<sup>10</sup> A letter from the Examiner was mailed April 25, 1997. It stated that Appellants' Response to Supplemental Examiner's Answer had been entered and considered, but no further response by the Examiner was deemed necessary.

This case was remanded to the Examiner on November 7, 2000, to consider the IDS received October 12, 2000. By letter mailed March 5, 2001, the Examiner stated that the IDS did not comply with 37 CFR §§ 1.97 and 1.98 and noted that it had been placed in the file. A second IDS was received February 24, 2001, and in a letter mailed March 27, 2001, the Examiner stated that the IDS filed February 24, 2001, had been considered and entered.

being unpatentable over Kimoto et al or Nakahata et al when taken with Cole or Olmstead, or Miura et al.

**A. Rejection of claims 1-3 under 35 U.S.C. § 102(b) as anticipated by Kimoto et al.**

We will not sustain the rejection of claims 1-3 under 35 U.S.C. § 102(b) as anticipated by Kimoto et al.

It is axiomatic that anticipation of a claim under 35 U.S.C. § 102 can be found only if the prior art reference discloses every element of the claim. See *In re King*, 801 F.2d 1324, 1326, 231 USPQ 136, 138 (Fed. Cir. 1986) and *Lindemann Maschinenfabrik GMBH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1458, 221 USPQ 481, 485 (Fed. Cir. 1984). "Anticipation is established only when a single prior art reference discloses, expressly or under principles of inherency, each and every element of a claimed invention." *RCA Corp. v. Applied Digital Data Systems, Inc.*, 730 F.2d 1440, 1444, 221 USPQ 385, 388 (Fed. Cir. 1984), cert. dismissed, 468 U.S. 1228 (1984), citing *Kalman v. Kimberly-Clark Corp.*, 713 F.2d 760, 772, 218 USPQ 781, 789 (Fed. Cir. 1983).

Appellants submit<sup>11</sup> that Kimoto et al shows a diamond semiconductor diode and does not teach any fluid sensing function or that the diamond layer should contact the fluid. Appellants

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<sup>11</sup> Brief, page 7 and Reply Brief, page 2.

assert that there are structural and functional differences between diodes and thermistors as opposed to fluid sensors, and that they are not equivalent, noting that fluid sensors may work without a thermistor.

Appellants point out<sup>12</sup> that claims 1-3 all specifically recite "an electric device for monitoring a fluid," and claim 1 recites that the device operates in response to a temperature change of the diamond film resulting from heat transfer to sense a parameter of the fluid. Appellants also point to claim 2 which recites that the second surface is in contact with the fluid, and to claim 3 which recites that the diamond film has an exposed surface to the fluid.

The Examiner<sup>13</sup> apparently recognizes that Kimoto et al does not disclose that the surface of his film is in contact with the fluid when used as a flow sensing device, but finds that it is inherent to do so. Furthermore, the Examiner<sup>14</sup> does not give any patentable weight to the claimed intended use of the apparatus, and states that the use of a thermistor in fluid flow measurements has been well known in the measuring and testing

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<sup>12</sup> Reply Brief, page 2.

<sup>13</sup> Examiner's Answer, page 4.

<sup>14</sup> Examiner's Answer, page 6.

art. In his second Examiner's Answer<sup>15</sup>, the Examiner admits Kimoto et al shows a diamond semiconductor diode and not a fluid sensing device.

Turning to claims 1-3, we find that in addition to the preamble's recited use of the electric device "for monitoring a fluid," the body of each of these claims provides further limitations directed to the fluid. In the body of claims 1 and 2, "said second surface is in contact with the fluid" is recited. Claim 3 recites<sup>16</sup> "said diamond film has an exposed surface to the fluid to be monitored." As these elements of the claim are not disclosed by Kimoto et al this rejection is reversed.

***B. Rejection of claims 1-3 and 8 under 35 U.S.C. § 102(b) as anticipated by Nakahata et al.***

Appellants submit<sup>17</sup> that Nakahata et al relates to a thermistor and not a fluid flow sensor and makes no mention of sensing a fluid. With respect to claim 8, Appellants specifically note that Nakahata et al does not suggest measuring a fluid passing by in a path.

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<sup>15</sup> Page 1

<sup>16</sup> At lines 3-4

<sup>17</sup> Brief, page 7 and Reply Brief, page 2

The Examiner<sup>18</sup> does not give any patentable weight to the claimed intended use of the apparatus as a flow sensor as "the second surface of the diamond film is in contact with the fluid which would have been inherently achieved when the device is used as a sensor."

Turning again to claims 1-3, we find that in addition to the preamble's recited use of the electric device "for monitoring a fluid," the body of each of these claims provides further limitations directed to the fluid. Claims 1 and 2 recite "said second surface is in contact with the fluid." Claim 3 recites "said diamond film has an exposed surface to the fluid to be monitored." The preamble of claim 8 recites "An electric device provided on a path for passing a fluid therethrough" (emphasis added), and in the first subparagraph thereof requires "one surface of said diamond film forming part of an inner wall of said path" (emphasis added). As these elements of the claim are not disclosed by Nakahata et al, this rejection is reversed.

***C. Rejection of claims 16 and 17 under 35 U.S.C. § 102(b) as anticipated by Bohrer et al***

Appellants submit<sup>19</sup> that Bohrer et al discloses a heater

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<sup>18</sup> Examiner's Answer, page 4, second last paragraph

<sup>19</sup> Brief, page 15

operated at constant temperature,<sup>20</sup> while Appellants' claimed invention calls for heat pulses applied to the film, a temperature variation of the film caused by the heat pulse being measured, and a measurement output being generated in response to the heat pulse. Appellants also point to claim 17 wherein "heat pulse" is twice recited.

In addition, Appellants contend that Bohrer et al does not apply "heat pulses" of the type disclosed in the specification and referenced in these claims.

We find, however, that Bohrer et al does perform a heat pulse operation as claimed and not only constant temperature operation as set forth as an earlier embodiment. Bohrer et al,<sup>21</sup> in an embodiment disclosed toward the end of his specification explicitly provides "the central element being self heated by current pulses," "the sensor resistance elements receive corresponding heat pulses," and "such that heat pulses cause corresponding heat pulses in the sensor elements." In addition, Bohrer et al states<sup>22</sup> "the heater can be pulsed or operated at frequencies of up to and beyond 50 Hz as desired."

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<sup>20</sup> Pointing to column 5, lines 10-20 of this reference

<sup>21</sup> At column 14, lines 59-68, through column 15, lines 1-38

<sup>22</sup> Column 17, lines 35-38

Although Bohrer et al states<sup>23</sup> that the pulse mode is not necessary or typically used in the preferred embodiment of his invention since it requires more complicated control circuitry, it is none-the-less a disclosed mode of operation for some applications.

We note that Appellants have not argued that Bohrer et al has failed to meet any of the other limitations of these claims. Appellants have chosen not to argue any other specific limitations of the claims as a basis for patentability. We are not required to raise and/or consider such issues. As stated by our reviewing court in *In re Baxter Travenol Labs.*, 952 F.2d 388, 391, 21 USPQ2d 1281, 1285 (Fed. Cir. 1991), "[i]t is not the function of this court to examine the claims in greater detail than argued by an appellant, looking for nonobvious distinctions over the prior art." 37 CFR § 1.192(a) as amended at 58 CFR 545 Oct. 22, 1993, which was controlling at the time of Appellants filing the brief, states as follows:

The brief . . . must set forth the authorities and arguments on which the Appellants will rely to maintain the appeal. Any arguments or authorities not included in the brief may be refused consideration by the Board of Patent Appeals and Interferences, unless good cause is shown.

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<sup>23</sup> Column 15, lines 31-35

Appeal No. 1996-3262  
Application No. 08/141,632

Also, 37 CFR § 1.192(c)(8)(iii) stated:

For each rejection under 35 U.S.C. § 102, the argument shall specify the errors in the rejection and why the rejected claims are patentable under 35 U.S.C. § 102, including any specific limitations in the rejected claims which are not described in the prior art relied upon in the rejection.

Thus, 37 CFR § 1.192 provides that just as the Court is not under any burden to raise and/or consider such issues this Board is not under any greater burden.

In view of the foregoing, the decision of the Examiner rejecting claims 16 and 17 under 35 U.S.C. § 102(b) is affirmed.

***D. Rejection of claims 5, 6 and 9-15 under 35 U.S.C. § 103 over Ohta et al when taken with Nakahata et al and Inada et al.***

We will not sustain the rejections of claims 5, 6, and 9-15 under 35 U.S.C. § 103.

The Examiner has failed to set forth a ***prima facie*** case. It is the burden of the Examiner to establish why one having ordinary skill in the art would have been led to the claimed invention by the express teachings or suggestions found in the prior art, or by implications contained in such teachings or suggestions. *In re Sernaker*, 702 F.2d 989, 995, 217 USPQ 1, 6 (Fed. Cir. 1983). "Additionally, when determining obviousness, the claimed invention should be considered as a whole; there is no legally recognizable 'heart' of the invention." *Para-Ordnance*

*Mfg. v. SGS Importers Int'l, Inc.*, 73 F.3d 1085, 1087, 37 USPQ2d 1237, 1239 (Fed. Cir. 1995), *cert. denied*, 117 S. Ct. 80 (1996) *citing W. L. Gore & Assocs., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 1548, 220 USPQ 303, 309 (Fed. Cir. 1983), *cert. denied*, 469 U.S. 851 (1984).

Appellants submit<sup>24</sup> that Ohta et al and Inada et al show direct-heated fluid flow measuring equipment that does not disclose or suggest use of a diamond film.

Appellants contend<sup>25</sup> that contrary to the Official Action there is no pulsed heating of a film in Ohta et al, as Ohta et al controls heat to maintain a constant difference in temperature between a sensing element and a temperature compensating element.

As regards to Inada et al, Appellants argue that it does not disclose or suggest a device with a thermally sensitive resistor thermally connected to the heat generator through a diamond film. As regards to Nakahata et al, Appellants repeat their arguments set forth in Section B above.

Appellants conclude that there is no motivation in any of the cited references to take a diamond thermistor as disclosed by

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<sup>24</sup> Brief, page 13

<sup>25</sup> Brief, page 13; Reply Brief, page 4

Nakahata et al and substitute this structure for components of either of the very different types of heated flow sensors disclosed by Inada et al or Ohta et al, as they are diverse devices with incompatible structural and operating characteristics, and different purposes.

The Examiner<sup>26</sup> contends that it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use a diamond film in the Ohta et al or Inada et al devices in order to achieve better speed response to temperature since diamond film is well known for its higher thermal response speed and good heat resistance. Further, the Examiner states he gave no weight to the limitation "a diamond film serving to be in contact with the fluid."

As regards to Ohta et al, the Examiner states<sup>27</sup> "Pulse heating is common in the art where a pulse of current is provided to the heating element to heat the fluid passing by and at the downstream end a sensor sensing the temperature of the heated fluid."

In regard to Appellants' argument that none of the

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<sup>26</sup> Answer, page 6

<sup>27</sup> First Answer, page 7

Appeal No. 1996-3262  
Application No. 08/141,632

references suggest a diamond film in direct contact with a fluid, the Examiner notes that this is true, but that no claim language requires the diamond film to be in **direct** contact with the fluid (emphasis added).

The Federal Circuit states that "[t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." *In re Fritch*, 972 F.2d 1260, 1266 n.14, 23 USPQ2d 1780, 1783-84 n.14 (Fed. Cir. 1992), citing *In re Gordon*, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). "Obviousness may not be established using hindsight or in view of the teachings or suggestions of the inventor." *Para-Ordnance*, 73 F.3d at 1087, 37 USPQ2d at 1239, citing *W. L. Gore & Assocs.*, 721 F.2d at 1551, 1553, 220 USPQ at 311, 312-13. In addition, our reviewing court requires the PTO to make specific findings on a suggestion to combine prior art references. *In re Dembiczak*, 175 F.3d 994, 1000-01, 50 USPQ2d 1614, 1617-19 (Fed. Cir. 1999).

As pointed out by our reviewing court, we must first determine the scope of the claim. "[T]he name of the game is the claim." *In re Hiniker Co.*, 150 F.3d 1362, 1369, 47 USPQ2d 1523, 1529 (Fed. Cir. 1998).

As regards to claims 5 and 9-15, we find that these claims specifically require contact with the fluid. See, *inter alia*, claims 5 and 12 which require "a diamond film in direct contact with the fluid;" claim 9 requires "a second surface in contact with said fluid;" claim 10 requires "at least said second surface in contact with said fluid;" claim 11 requires "one planar surface of said diamond film in contact with a fluid;" claim 15 requires "a diamond film having an exposed surface to contact a fluid to be monitored." Contrary to the position of the Examiner, we hold that having an intermediate structure contact the fluid is not providing for contact between the fluid and the film surface as claimed.

As regards claim 6, we find that this claim specifically requires that the heat generator generate a heat pulse and the thermally sensitive resistor measures a temperature variation of the diamond film caused by the heat pulse. Ohta et al does not teach the generation of a heat pulse. Ohta et al teaches<sup>28</sup> an embodiment wherein a trigger pulse is given to initiate heating of a heater resistor. The heating then continues until a constant difference in temperature between the sensing element

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<sup>28</sup> Column 7, lines 40-53

and the temperature compensating element is generated, or until the sensing element reaches a constant value. Thus, while heat is generated in response to a trigger pulse, there is no disclosure of the heat being in pulse form.

The Examiner's argument<sup>29</sup> that "[p]ulse heating is common in the art where a pulse of current is provided to the heating element to heat the fluid passing by," is not well taken. There is no teaching that Ohta et al transmits a pulse of current to its heating element, or that if a pulse is used to trigger heating that the heating element would necessarily produce a heat pulse.

Furthermore, it is noted in general that although Nakahata et al discloses numerous benefits obtained by using diamond as a thermistor, there is no motivation in any of the cited references to take a diamond thermistor as taught by Nakahata et al and modify the electrical device component placement, and thermal connections and disconnections, as claimed.

Accordingly, we will not sustain the rejections of claims 5, 6 and 9-15 under 35 U.S.C. § 103.

***E. Rejection of claims 1-3 under 35 U.S.C. § 103 over Kimoto***

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<sup>29</sup> Examiner's Answer, page 7

***et al or Nakahata et al when taken with Cole or Olmstead, or  
Miura et al.***<sup>30</sup>

As regards the Kimoto et al patent, Appellants repeat<sup>31</sup> their arguments presented in Section A above, that Kimoto et al shows a diamond semiconductor diode and does not teach any fluid sensing function or that the diamond layer should contact the fluid. In addition, Appellants assert that a teaching relating to a diode does not inherently motivate use of such a diode as a fluid sensor device with the diamond film exposed to the fluid.

With respect to the Nakahata et al reference, Appellants repeat<sup>32</sup> their argument that Nakahata et al relates to a thermistor as a temperature sensor and compensator for an electric circuit and not a fluid flow sensor and makes no mention of sensing a fluid. In addition, Appellants again argue that Nakahata et al teaches<sup>33</sup> away from his diamond film being in contact with a fluid to be sensed by suggesting that a protective film be provided to cover exposed parts of the diamond film.

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<sup>30</sup> The Aslam patent was withdrawn as a reference in the Supplemental Examiner's Answer mailed December 26, 1996.

<sup>31</sup> Supplemental Reply Brief, page 2

<sup>32</sup> See Section B above

<sup>33</sup> Column 2, lines 45-49

In contrasting Kimoto et al and Nakahata et al to claims 1 and 2, Appellants assert<sup>34</sup> that these references do not teach that a resistor be provided on a first surface of a diamond film and a fluid be in contact with a second surface of the diamond film, where the first surface is opposite the second surface. As to claim 3, Appellants point out that this claim recites that the diamond film is supported by a substrate and is thermally insulated from the substrate, and this feature is not disclosed by these references.

With respect to Olmstead and Miura et al, Appellants recognize that these references disclose fluid flow measuring systems incorporating semiconductor devices. Appellants then assert that there is no suggestion in any of these references that there would be any advantages in providing a diamond filter layer in their devices.

In addition, Appellants argue that changes must be made in the structure of a Nakahata-type device, and a new supporting structure must be provided in order to create an operable fluid sensor incorporating a diamond device as claimed. Appellants also assert that there is no specific motivation in any of the

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<sup>34</sup> Response to Supplemental Examiner's Answer, page 1

cited references to make these non-trivial changes.

Finally, Appellants argue<sup>35</sup> that there is no teaching of record motivating a person of ordinary skill in the art to use a diamond layer for fluid contact in a fluid sensor, and that diamond has the unobvious advantage of being sturdy, resistant to fluid contact even in cases where the fluid is corrosive, and a good conductor of heat for sensing purposes.

The Examiner points out<sup>36</sup> that Kimoto et al discloses making a semiconductor diode with a diamond film (2) and a resistor (3), including a diamond film having a resistor provided on one surface of the film and a substrate on the other surface. He notes that Nakahata et al discloses a diamond film (31), a resistor (32) provided on one surface and the second surface being a terminal surface of crystal growth.

Cole is noted to disclose a solid-state anemometer with a thick film microcircuit for measuring fluid using a pair of zener diodes wherein one is exposed to the flowing fluid. The zener diode chips are bonded to a ceramic substrate. Olmstead and

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<sup>35</sup> Supplemental Reply Brief, page 4

<sup>36</sup> Supplemental Examiner's Answer mailed August 20, 1996, page 2; Supplemental Examiner's Answer mailed December 26, 1996, pages 1 and 2

Appeal No. 1996-3262  
Application No. 08/141,632

Miura et al are noted to disclose fluid measuring apparatus using semiconductor devices as heating and sensing elements, and the sensing elements are temperature sensing diodes. Olmstead is specifically noted to teach electrical elements formed on semiconductor chips and thermally coupled to the fluid.

The Examiner then reiterates that the structure of the invention as set forth in claims 1-3 is taught by Kimoto et al and Nakahata et al and its intended use is taught by Miura et al, Cole, and Olmstead.

The Examiner then states, without citing any evidentiary basis, that diamond film deposited directly on high temperature materials leads to improved monitoring and more accurate readings which are known to be important in research, such as petroleum and chemical fields. He then submits that diamond film semiconductor diodes have been used as thermal sensors besides use as a thermistor and that the use of a semiconductor diode as a fluid sensing device is well known in the art where a diode is used as either a heating element or a sensing element. He then finds that it would have been obvious to a skilled artisan at the time the invention was made to use the diamond film semiconductor diode as taught by Kimoto et al or Nakahata et al for sensing the flow in Miura et al, Cole or Olmstead since, as known, diamond

has good thermal response, good heat resistance and is chemically stable at higher temperatures.

In response to Appellants' arguments<sup>37</sup> that there is no suggestion that Nakahata's device would be useful as a component of a fluid sensor, the Examiner finds that this use is nothing more than using the device for sensing temperature of the fluid, and sensing temperature of any object would have been obvious to a skilled artisan. Since Miura et al, Cole and Olmstead teach using a semiconductor device for sensing or measuring fluid flow, and the kind of semiconductor device used depends on requirements of reliability and accuracy, the use of a reliable diamond semiconductor for sensing fluid flow would have been an obvious alternative to other semiconductors. It is asserted that the test for obviousness is what the combined teachings of the references would have suggested to those of ordinary skill in the art and that this test has been met for the reasons set forth above.

Here again, we note that we must first determine the scope of the claim. "[T]he name of the game is the claim."

*In re Hiniker Co., supra.*

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<sup>37</sup> Supplemental Examiner's Answer mailed December 26, 1996, pages 1 and 2

Claim 1, following the preamble, recites "a diamond film having a first surface and a second surface on an opposite side of said first surface." Nakahata et al discloses<sup>38</sup> a diamond film 31 which has opposed upper and lower surfaces. The second subparagraph of this claim recites "a resistor provided on said first surface of said diamond film and measuring a temperature of said diamond film." Semiconductor diamond film 32 of Nakahata et al is on the upper surface of the diamond film 31 and measures a temperature of said diamond film as it is connected thereto and operates as a thermistor. The final subparagraph of this claim recites "wherein at least said second surface is in contact with the fluid in response to a temperature change of said diamond film resulting from said heat transfer to sense a parameter of the fluid." The lower surface of diamond film 31 of Nakahata's thermistor is clearly exposed to contact with its environment and the thermistor, in response to a temperature change in diamond film 31 will sense a parameter of the environmental matter surrounding it.

Nakahata et al also discloses<sup>39</sup> that thermistors comprising

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<sup>38</sup> Figure 3

<sup>39</sup> Column 1, lines 19-28 and column 4, lines 64-68 through column 5, lines 1-3

diamonds provide use at higher temperatures than otherwise possible with other materials, they are chemically stable at high temperatures and can be used at temperatures up to 800 degrees C. This reference also teaches prior art recognition that diamond has the largest thermal conductivity of all substances and a small specific heat, thus a thermistor comprising diamond is expected to have a high thermal response speed. Further disclosed is that the diamond thermistor taught can easily be miniaturized as it can be prepared by the thin film process.

Not disclosed by this reference is the limitation of "for monitoring a fluid" as recited in the claim, and the last subparagraph's requirement of "said second surface is in contact with the fluid in response to a temperature change of said diamond film resulting from said heat transfer to sense a parameter of the fluid."

Miura et al teaches<sup>40</sup> semiconductor type flow rate detectors wherein the semiconductors are exposed to the ambient environmental fluid. Also taught is the prior art problem of degraded flow meter response caused by the increased heat capacity due to the substrate.

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<sup>40</sup> See, *inter alia*, the abstract, column 3, lines 3-68, and figures 2-4

Appeal No. 1996-3262  
Application No. 08/141,632

It is established that regarding reasons to combine prior art teachings, "[a] suggestion may come from the nature of the problem to be solved, leading inventors to look to references relating to possible solutions to that problem." *Pro-Mold & Tool Co. v. Great Lakes Plastics*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1630 (Fed. Cir. 1996) *citing In re Rinehart*, 531 F.2d 1048, 1054, 189 USPQ 143, 149 (CCPA 1976) (considering the problem to be solved in a determination of obviousness). The Federal Circuit reasons in *Para-Ordnance Mfg. v. SGS Importers Int'l Inc.*, 73 F.3d 1085, 1088-89, 37 USPQ2d 1237, 1239-40 (Fed. Cir. 1995), that

"for the determination of obviousness, the court must answer whether one of ordinary skill in the art who sets out to solve the problem and who had before him in his workshop the prior art, would have reasonably expected to use the solution that is claimed by Appellants."

*Para-Ordnance Mfg.*, 73 F.3d at 1087, 37 USPQ2d at 1239, *citing W. L. Gore & Assocs., Inc.*, 721 F.2d at 1553, 220 USPQ at 312-13.

Therefore we find that one having ordinary skill in this art would have been led to the invention recited in claim 1 by the express teachings or suggestions found in this prior art, or by implications contained in such teachings or suggestions.

Claim 2 differs materially from claim 1 only in its final

subparagraph's recitation of "wherein said resistor is thermally connected only with said diamond film, and said second surface is in contact with the fluid." (emphasis added). Nakahata et al does not disclose this limitation. Nakahata et al provides<sup>41</sup> that resistor 12 is thermally connected not only with diamond film 11, but also with electrodes 13 and leads 14, and at its sides with the ambient environment, while, at most, being thermally insulated only on its top by protective film 15.

Therefore, we do not affirm the rejection of claim 2.

As to claim 3, the prior art applied by the Examiner is devoid of disclosure of the claimed "diamond film supported by said substrate, wherein said diamond film is thermally insulated from said substrate" (emphasis added), and "said diamond film has an exposed surface to the fluid to be monitored." The Examiner has not specifically addressed these claim limitations and has failed to show which specific elements of the cited references he has applied to this claim.

Therefore, we do not affirm the rejection of claim 3.

The Examiner's reliance upon the Kimoto et al reference as an alternative disclosure of the claimed thermistor structure, is

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<sup>41</sup> See figure 1. The remaining embodiments disclosed by Nakahata et al are less relevant.

misplaced. This reference fails to disclose limitations recited in each of claims 1-3. For example, when applied to claim 1, if the resistor 3 of Kimoto et al is read to be on the diamond film's 2 first surface, as required by the second subparagraph of this claim, then the second surface of Kimoto et al's diamond film 2 is not "in contact with the fluid" as required by the third subparagraph of this claim. As to claim 2, when the resistor 3 is on the first surface of the diamond film 2, the second surface of the diamond film of Kimoto et al would not be in contact with the fluid, but with the diamond substrate 1. As regards to claim 3, the diamond film 2 of Kimoto et al is not "thermally insulated from the substrate" as claimed, and fails to show the claim requirement of "an exposed surface to the fluid to be monitored."

Therefore, contrary to the Examiner's assertion<sup>42</sup>, Kimoto et al does not disclose the claimed thermistor structure. Cole, Olmstead and Miura et al are not directed to diamond diodes or thermistors and do not teach any of the diamond thermistor structure of claims 1-3.

Consequently, the Examiner has failed to set forth prior art

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<sup>42</sup> Supplemental Examiner's Answer mailed December 26, 1996, at page 1

Appeal No. 1996-3262  
Application No. 08/141,632

which discloses or obviates all of the limitations set forth in claims 2 and 3.

We are not inclined to dispense with proof by evidence when the proposition at issue is not supported by a teaching in a prior art reference or shown to be common knowledge of unquestionable demonstration. Our reviewing court requires this evidence in order to establish a *prima facie* case. *In re Piasecki*, 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-88 (Fed. Cir. 1984); *In re Knapp-Monarch Co.*, 296 F.2d 230, 232, 132 USPQ 6, 8 (CCPA 1961); *In re Cofer*, 354 F.2d 664, 668, 148 USPQ 268, 271-72 (CCPA 1966). Furthermore, our reviewing court states in *In re Piasecki*, 745 F.2d 1468, 223 USPQ 785, 788 (Fed. Cir. 1984) the following:

The Supreme Court in *Graham v. John Deere Co.*, 383 U.S. 1 (1966), focused on the procedural and evidentiary processes in reaching a conclusion under Section 103. As adapted to ex parte procedure, Graham is interpreted as continuing to place the "burden of proof on the Patent Office which requires it to produce the factual basis for its rejection of an application under section 102 and 103." *Citing In re Warner*, 379 F.2d 1011, 1020, 154 USPQ 173, 177 (CCPA 1967).

Therefore, we will sustain the rejection of claim 1 and not sustain the rejection of claims 2-3 under 35 U.S.C. § 103 as being unpatentable over Kimoto et al or Nakahata et al when taken with Cole or Olmstead, or Miura et al.

**CONCLUSION**

We have sustained the rejection of claims 16 and 17 under 35 U.S.C. § 102(b) as anticipated by Bohrer et al, and the rejection of claim 1 under 35 U.S.C. § 103 as being unpatentable over Nakahata et al when taken with Cole, Olmstead or Miura et al.

We have not sustained the following rejections:

1) The rejection of claims 1-3 under 35 U.S.C. § 102(b) as anticipated by Kimoto et al; and

2) The rejection of claims 1-3 and 8 under 35 U.S.C. § 102(b) as anticipated by Nakahata et al; and

3) The rejection of claims 5, 6 and 9-15 under 35 U.S.C. § 103 over Ohta et al when taken with Nakahata et al and Inada et al; and

4) The rejection of claims 2-3 under 35 U.S.C. § 103 as being unpatentable over Kimoto et al or Nakahata et al when taken with Cole or Olmstead, or Miura et al.

Appeal No. 1996-3262  
Application No. 08/141,632

No time period for taking any subsequent action in  
connection with this appeal may be extended under 37 CFR  
§ 1.136(a).

***AFFIRMED-IN-PART***

JERRY SMITH	)	
Administrative Patent Judge	)	
	)	
	)	
MICHAEL R. FLEMING	)	BOARD OF PATENT
Administrative Patent Judge	)	APPEALS AND
	)	INTERFERENCES
	)	
	)	
ANITA PELLMAN GROSS	)	
Administrative Patent Judge	)	

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Appeal No. 1996-3262  
Application No. 08/141,632

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